Plant Assessment Form

For use with the "Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands" by the California Exotic Pest Plant Council and the Southwest Vegetation Management Association (Warner et al. 2003)

Printable version, February 28, 2003
(Modified for use in Arizona, 07/02/04)

Table 1. Species and Evaluator Information

Species name (Latin binomial)**:**	*Conium maculatum* L. (USDA 2005)
Synonyms:	None listed in USDA (2005).
Common names:	Poison hemlock, carrot fern, poison parsley, spotted hemlock, deadly hemlock, cigue maculae, cigue tachetee
Evaluation date (mm/dd/yy)**:**	02/08/04
Evaluator #1 Name/Title:	Dana Backer/Conservation Ecologist
Affiliation:	The Nature Conservancy
Phone numbers:	(520) 622−3861
Email address:	Dbacker@tnc.org
Address:	1510 E. Fort Lowell Tucson, Arizona 85719
Evaluator #2 Name/Title:	
Affiliation:	
Phone numbers:	
Email address:	
Address:	

List committee members:	W. Albrecht, W. Austin, D. Backer, J. Crawford, H. Folger, L. Moser, F. Northam, B. Phillips, K. Watters
Committee review date:	02/17/04
List date:	02/17/04
Re-evaluation date(s):	

Table 2. Scores, Designations, and Documentation Levels

Question		Score	Documentation Level	Section Scores	Overall Score & Designations
1.1	Impact on abiotic ecosystem processes	**U**	No information	**"Impact"** **Section 1 Score:** **B**	**"Plant Score"** **Overall Score:** **Medium** **Alert Status:** **Alert**
1.2	Impact on plant community	**C**	Other published material		
1.3	Impact on higher trophic levels	**B**	Other published material		
1.4	Impact on genetic integrity	**D**	Reviewed scientific publication		
2.1	Role of anthropogenic and natural disturbance	**C**	Observational	**"Invasiveness"** *For questions at left, an A gets 3 points, a B gets 2, a C gets 1, and a D or U gets=0. Sum total of all points for Q2.1-2.7:* **15 pts** **Section 2 Score:** **B**	
2.2	Local rate of spread with no management	**B**	Observational		
2.3	Recent trend in total area infested within state	**B**	Observational		
2.4	Innate reproductive potential	**A**	Reviewed scientific publication		
2.5	Potential for human-caused dispersal	**B**	Other published material		
2.6	Potential for natural long-distance dispersal	**B**	Other published material		
2.7	Other regions invaded	**A**	Other published material		RED FLAG **NO** Information you should know.
3.1	Ecological amplitude	**B**	Observational	**"Distribution"** **Section 3 Score:** **C**	
3.2	Distribution	**D**	Observational		

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes *Score:* **U** *Doc'n Level:* **No info.**
Identify ecosystem processes impacted: No known information.
Rationale: Several individuals were contacted, but not one person was able to provide any documentation or observations.
Sources of information: No literature or observations relevant to the question were found.

Question 1.2 Impact on plant community composition, structure, and interactions *Score:* **C** *Doc'n Level:* **Other pub.**
Identify type of impact or alteration: Minor alteration of community composition.
Rationale: Pioneer species that colonizes disturbed sites (biennial) and can displace natives during early successional stages (Pitcher 1989). In Australia: "Rapid establishment after autumn rains, particularly on disturbed sites or areas where there is little vegetation. Once firmly established under such conditions, hemlock can preclude most other vegetation and establish pastures" (Parsons 1973 in Pitcher 1989). **Note:** Working Group members interpreted pastures to mean dense monotypic stands and not open range. Poison hemlock can spread quickly after the rainy season in areas that have been cleared or disturbed. Once established, it is highly competitive and prevents establishment of native plants by overshading (L. Serpa, letter to T. Thomas of The Nature Conservancy, 1989, as cited in Drewitz 2000). Field experiments have not established any allelopathic effects of poison hemlock (L. Serpa, letter to T. Thomas of The Nature Conservancy, 1989, as cited in Drewitz 2000).
Sources of information: See cited literature.

Question 1.3 Impact on higher trophic levels *Score:* **B** *Doc'n Level:* **Other pub.**
Identify type of impact or alteration: Toxic to wildlife and degrades habitat quality.
Rationale: From DiTomaso (1999): poisonous to humans, wildlife, and livestock (contains eight alkaloids). The plant has a musty unpleasant odor associated with the alkaloids and because of this odor, animals will usually not consume the hemlock when other food is available (Panter and Keeler 1988, Jeffery and Robinson 1990). Poison hemlock can also cause skin irritations and rashes by simply brushing up against the plant. Degrades habitat quality (Pitcher 1989; did not specify location). Wildlife is susceptible to the toxic effects of poison hemlock. Ten percent of an elk population on Grizzly Island, California, died from ingesting poison hemlock in 1985 (Parsons and Cuthbertson 1992 in Drewitz 2000). In Arizona the current populations of poison hemlock do not form dense patches. More typically populations are considered patchy and sparse (Working Group discussion). The largest population is approximately two acres (Watson Woods, near Prescott; F. Northam, personal communication, 2004). During testing of phytophagous insects as a biocontrol, it was noted that poison hemlock hosts few insect species (Goeden and Ricker 1982). A defoliating moth, *Agonopterix alstroemeriana,* is used as a biocontrol agent with good to excellent control in Oregon, Washington, and Idaho (William et al. 1998 in Makarick 1999).
Sources of information: See cited literature. Also considered personal communication with F. Northam (Weed Biologist, Tempe, Arizona, 2004).

Question 1.4 Impact on genetic integrity *Score:* **D** *Doc'n Level:* **Rev. sci. pub.**
Identify impacts: No known hybridization.

Rationale: No known native *Conium* species in Arizona or in North America.
Sources of information: Kearney and Peebles (1960) and DiTomaso (1999).

Question 2.1 Role of anthropogenic and natural disturbance in establishment *Score:* **C** *Doc'n Level:* **Obs**.
Describe role of disturbance: Requires some degree of natural or anthropogenic disturbance to establish.
Rationale: Commonly occurs along roadsides, field margins, ditches and low-lying areas. Also invades native plant communities in floodplains and riparian areas in southern California (Goeden and Ricker 1982). It does best in disturbed areas where soil is moist with some shade. Poison hemlock is also able to form stands in dry, open areas (Parsons [and Cuthbertson] 1992 in Drewitz 2000). Where currently established in Arizona, the areas where it invades have had both natural and anthropogenic disturbance. Working Group members inferred that natural disturbance needs to be coupled with an anthropogenic disturbance for *C. maculatum* to establish.
Sources of information: See cited literature. Also considered inference by Working Group members.

Question 2.2 Local rate of spread with no management *Score:* **B** *Doc'n Level:* **Obs.**
Describe rate of spread: Increases but less rapidly than doubling in <10 years.
Rationale: In newly disturbed areas it can spread rapidly (DiTomaso 1999). In Australia: "Rapid establishment after autumn rains, particularly on disturbed sites or areas where there is little vegetation. Once firmly established under such conditions, hemlock can preclude most other vegetation and establish pastures" (Parsons 1973 in Pitcher 1989). **Note:** Working Group members interpreted pastures to mean dense monotypic stands and not open range. In California poison hemlock can spread quickly after the rainy season in areas that have been cleared or disturbed. Once established, it is highly competitive and prevents establishment of native plants by overshading (L. Serpa, letter to T. Thomas of The Nature Conservancy, 1989, as cited in Drewitz 2000). Although poison hemlock was first documented in Arizona in 1938 (SEINet 2004), few documented locations exist (homesteads, highly disturbed sites). Several Working Group members commented that this species could be coming out of its lag phase and new populations may be occurring (see section 3).
Sources of information: See cited literature. Also considered information from SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed February, 2004). The documentation level reflects Arizona observations and Working Group member discussions, not the sources and rates of spread from other states reported in the literature.

Question 2.3 Recent trend in total area infested within state *Score:* **B** *Doc'n Level:* **Obs.**
Describe trend: Increasing but less rapidly than doubling the total area infested in <10 years.
Rationale: In the last several years, new populations have been documented in northern Arizona (see section 3). Poison hemlock may just now be beginning to spread into new areas. Awareness about this species is increasing and perhaps individuals are just now starting to become observant of this plant.
Sources of information: Personal communications with F. Northam (Weed Biologist, Tempe, Arizona, 2004), L. Moser (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest, Flagstaff, Arizona, 2004), and B. Phillips (Zone Botanist, U.S. Department of Agriculture, Forest Service, Coconino, Prescott, and Kaibab National Forest, Flagstaff, Arizona, 2004).

Question 2.4 Innate reproductive potential *Score:* **A** *Doc'n Level:* **Rev. sci. pub.**
Describe key reproductive characteristics: Biennial that reproduces only by seed.

Rationale: See Worksheet A.
Sources of information: See Worksheet A.

Question 2.5 Potential for human-caused dispersal	*Score:* **B** *Doc'n Level:* **Other pub.**
Identify dispersal mechanisms: Moderate dispersal but not at a high level; disperses via humans, pets, livestock, vehicles, and farm and fire equipment.	
Rationale: Seed is ribbed which enables it to adhere to clothing, fur, and vehicles (Pitcher 1989 in DiTomaso 1999). Significant problem in alfalfa fields during first cutting [in hay] (Jeffery and Robinson 1990). Can be found in grain fields where it can contaminate harvested seed (Panter and Keeler 1990, Lazarides and Hince 1993).	
Sources of information: See cited literature.	

Question 2.6 Potential for natural long-distance dispersal	*Score:* **B** *Doc'n Level:* **Other pub**.
Identify dispersal mechanisms: Occasional long-distance dispersal by animals and water.	
Rationale: Seeds spread by animal fur, birds, water, and to a limited extent wind (Parsons 1973 in Pitcher 1989, Panter and Keeler 1988). No well developed mechanism for long-distance dispersal. Most seeds fall at the base of the plant (Panter and Keeler 1988).	
Sources of information: See cited literature.	

Question 2.7 Other regions invaded	*Score:* **A** *Doc'n Level:* **Other pub**.
Identify other regions: Invades marshes, meadows [alpine/subalpine grasslands], semi-desert grasslands, and desert washes [Sonoran riparian] not yet invaded in Arizona.	
Rationale: Native to Europe, western Asia, and North Africa (Pitcher 1989). Poison hemlock inhabits banks of streams and rivers in North and South America (Mitich 1998). It has spread to become naturalized (i.e., reproduce consistently and sustain populations over many life cycles without direct intervention by humans [Richardson et al. 2000]) in nearly every state in U.S. (DiTomaso 1999). Listed as noxious weed in Colorado, Iowa, Idaho, New Mexico, Nevada, Ohio, Oregon, South Dakota, and Washington, and it occurs in all conterminous states of the U.S. except Mississippi and Florida (USDA 2005). From Drewitz (2000): "It was brought to the United States as a garden plant sometime in the 1800s and sold as a "winter fern" (Goeden and Ricker 1982, Parish 1920). In California the earliest poison hemlock collections were made in 1893 and 1897 in Berkeley and Truckee, respectively (Parish 1920). Poison hemlock has spread throughout the United States, Canada, Australia, New Zealand, and South America (Parsons [and Cuthbertson] 1992, Holm et al. 1979). California ecological types invaded but not invaded in Arizona include: valley and foothill grassland (assumed comparable to semi-desert grasslands), meadow and seep, marsh and swamp, and desert washes (assumed comparable to Sonoran riparian) (DiTomaso 2003). Has been documented to invade native plant communities associated with riparian woodlands and open flood plains of rivers and streams in southern California (Goeden and Ricker 1982). In Utah poison hemlock is present in wet boggy meadows (Welsh et al. 1987).	
Sources of information: See cited literature. Also considered information from J. DiTomaso (2003; draft plant assessment for *Conium maculatum* for California; available online at: http://www.cal-ipc.org; accessed January 2004).	

Question 3.1 Ecological amplitude	*Score:* **B** *Doc'n Level:* **Obs.**
Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: Found in two major ecological types in Arizona (Forests and Riparian).	

Rationale: In Utah found from 1400 to 2990 m (Welsh et al. 1993) and Arizona up to 2285 m (Epple 1995). Earliest record in Arizona collections is 1938 (SEINet 2004).

From Drewitz (2000): "Poison hemlock has spread throughout California in areas below 5,000 feet (1,500 m) elevation, excluding the Great Basin and Desert provinces (Pitcher 1989 [cited as 1986 by Drewitz], Hickman 1993). It is commonly found in dense patches along roadsides and fields. It also thrives in meadows and pastures and is occasionally found in riparian forests and flood plains (Goeden and Ricker 1982). It does best in disturbed areas where soil is moist with some shade. Poison hemlock is also able to form stands in dry, open areas (Parsons [and Cuthbertson] 1992)."

More competitive under wetter soil conditions, can survive in dry sites (Tucker et al. 1964 DiTomaso 1999). Does not require light to germinate and has a short lived seed bank (up to about three years; Baskin and Baskin 1990). *Conium maculatum* is present in areas dominated by cottonwood and willow; elevation 4000 to 5200 feet; 12 to 15 inches precipitation; moist soil; wetland obligate (M. Baker, personal communication, 2004).

Sources of information: See cited literature. Also considered information from SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed February, 2004) and personal communication with M. Baker (Botanist, consultant for the U.S. Department of Agriculture, Forest Service in northern Arizona, 2004).

Question 3.2 Distribution *Score:* **D** *Doc'n Level:* **Obs.**

Describe distribution: Present but less than 5% occurrence in all ecological types invaded.

Rationale: Currently has limited distribution in the ecological types where it is documented. Southwestern interior riparian: Watson Woods (Prescott) and Fossil Creek. Montane riparian: West Fork Oak Creek, Rio de Flag, Sinclair Wash (Flagstaff), and Delray Springs area. Montane conifer forest: McMillian Mesa;

Sources of information: Personal communications with F. Northam (Weed Biologist, Tempe, Arizona, 2004), L. Moser (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest, Flagstaff, Arizona, 2004), B. Phillips (Zone Botanist, U.S. Department of Agriculture, Forest Service, Coconino, Prescott, and Kaibab National Forest, Flagstaff, Arizona, 2004), M. Baker (Botanist, consultant for the U.S. Department of Agriculture, Forest Service in northern Arizona, 2004), and K. Watters (Biotech, Colorado Plateau Cooperative Ecosystem Studies Unit and National Park Service, Grand Canyon National Park, Flagstaff, Arizona, 2004).

Worksheet A. Reproductive Characteristics

Complete this worksheet to answer Question 2.4.

Reaches reproductive maturity in 2 years or less	**Yes**	**No**	**1 pt.**
Dense infestations produce >1,000 viable seed per square meter	**Yes**	**No**	**2 pt.**
Populations of this species produce seeds every year.	**Yes**	**No**	**1 pt.**
Seed production sustained for 3 or more months within a population annually	**Yes**	**No**	**1 pt.**
Seeds remain viable in soil for three or more years	**Yes**	**No**	**2 pt.**
Viable seed produced with *both* self-pollination and cross-pollination	**Yes**	**No**	**1 pt.**
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	**Yes**	**No**	**1 pt.**
Fragments easily and fragments can become established elsewhere	**Yes**	**No**	**2 pt.**
Resprouts readily when cut, grazed, or burned	**Yes**	**No**	**1 pt.**

Total pts: 6 Total unknowns: 1

Score : A

Note any related traits: Produces over 38,000 seeds/plant (Whittet 1968 in Mitich 1998). The combination of long seed dispersal period, seed dormancy, and non-specific germination requirements enable poison hemlock seedlings to emerge in almost every month of the year. Germination takes place in all months of the year except April, May, and June, with late winter and early spring being the periods of greatest germination (Roberts 1979). In Arizona the poison hemlock population produces seed within a short window of time (approxmately one month after flowering).

From Baskin and Baskin (1990): plants disperse about 90 percent of their seed in September through December, with the remainder dispersed by late February. This lengthy dispersal period allows poison hemlock to produce new seedlings continuously for several months. Poison hemlock has a large range of environmental conditions in which it can germinate. It can germinate at mean daily maximum temperatures greater than 9.3˚C and lower than 33.8˚C. It can germinate in darkness as well as in light. About 85 percent of seed produced is able to germinate soon after it leaves the parent plant. The longer dispersal is delayed in time, the higher the germination percentage the following fall. Seed can remain viable in the soil for at least three years.

Worksheet B. Arizona Ecological Types

(*sensu* Brown 1994 and Brown et al. 1998)

Major Ecological Types	Minor Ecological Types	Code*
Dunes	dunes	
Scrublands	Great Basin montane scrub	
	southwestern interior chaparral scrub	
Desertlands	Great Basin desertscrub	
	Mohave desertscrub	
	Chihuahuan desertscrub	
	Sonoran desertscrub	
Grasslands	alpine and subalpine grassland	
	plains and Great Basin shrub-grassland	
	semi-desert grassland	
Freshwater Systems	lakes, ponds, reservoirs	
	rivers, streams	
Non-Riparian Wetlands	Sonoran wetlands	
	southwestern interior wetlands	
	montane wetlands	
	playas	
Riparian	Sonoran riparian	
	southwestern interior riparian	**D**
	montane riparian	**D**
Woodlands	Great Basin conifer woodland	
	Madrean evergreen woodland	
Forests	Rocky Mountain and Great Basin subalpine conifer forest	
	montane conifer forest	**D**
Tundra (alpine)	tundra (alpine)	

*A means >50% of type occurrences are invaded; B means >20% to 50%; C means >5% to 20%; D means present but ≤5%; U means unknown (unable to estimate percentage of occurrences invaded).

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